

DETAILED ACTION

1. Claims 28-62 are pending in this application; Claims 56-58, 61 are withdrawn; Claims 28-55, 59-60, 62 are examined.

Election/Restrictions

2. Claims 56-58, 61 are withdrawn from further consideration pursuant to 37 CFR 1.142(b), as being drawn to a nonelected species structure, there being no allowable generic or linking claim. Applicant timely traversed the restriction (election) requirement in the reply filed on 14 September 2011.
3. Applicant's election with traverse of Group I in the reply filed on 14 September 2011 is acknowledged. The traversal is on the ground(s) that the Examiner is deficient in proving grounds for restriction/election. This is not found persuasive, see answers to Arguments presented below.
4. Applicant argues:
5. That burden of search has not been established to indicate the materials are distinct.
6. In response, highlighted by underlining the difference in unity by the previous Examiner, are presented in the previous Election requirement, for the election groups applicable to Groups I and II.
7. Group I is for a membrane. Group II is for a coating. As such, the material species are taken as being different as they do not overlap in scope due to their

structure as a membrane is classed differently than a coating as a coating requires a substrate whereas a membrane does not.

8. Applicant further argues:

9. That Claims 56-58 and 61 correspond to original Claims 28-55 and 59-60; further, the previous European Examiner did not require lack of unity and that

10. In response, the references cited by European Examiner, corresponding to "X" designations are applicable to inherently indicating that the prior art discloses the Application claims to which it the PCT Document proceeding summary of (30 June 2006 amended to the submitted priority WIPO document WO 2005/063862); this is applicable to describing lack of unity as the material claimed is disclosed in the prior art (see WIPO appended PCT report).

11. As such, the requirement is alternatively stated as follows:

12. Groups I: Claim 28 and dependent Claims 29-55, 59, 60; Claim 62

13. Group II: Claim 56 and dependent Claims 57-58 and 61;

14. The method of Claim 62 is a process applicable to the product by process Claims of Claims 28 and 56 according to the structure of Group I Claims; although Claim 28 does not depend upon Claim 62, Claim 28 is made by a process identical to Claim 62. However, the product by process Claim 56 "can be made" according to the steps of Claim 62; therefore, the unity of invention is not extended to method in which Claim 56 is made as long as another method is applicable.

15. Therefore, the method of Claim 62 is not a common technical feature between the Species structure Groups I, II.

16. Further, Claim 56 of Species Group II comprises limitations that do not require the coating of Claim 56 to be made according to the process of Claim 62, and also afforded the structure of Claims 28-55, 59-60; Group I claims require the material made to be self-supporting where as a coating of Group II structure requires a substrate onto which a coating is to be applied. Group II claims are therefore taken as requiring a surface or support for contacting in order to be a coating. In addition, Group II claims require an electrode for support.

17. Further, unity does not require the formation of a coating; Claim 56 requires electrodes to have polymer coatings and a coating requires a substrate; as such, a coating is not an item that is self-supporting, thus, Claim 56 does not have unity with element E) for Claim 28 or E) for Claim 61, as the coating of Claim 56 is not self-supporting.

18. As Claim 28 and Claim 62 do not require an electrode, an electrode of Claim 56 is also not taken as applicable for unity of invention.

19. Therefore, in regard to unity between Claims 56, Claim 28 and Claim 62: Claims 28 and 62 only share the unity of: "a proton conducting polymer based on polyazoles", with Claim 56.

20. Proton conducting polymers are known in the art.

21. As such:

22. This Application contains claims directed to more than one species of the generic invention. These species are deemed to lack unity of invention because they are not so linked as to form a single general inventive concept under PCT Rule 13.1.

23. The species are as follows:
24. Group I, Claim(s) 28—55, 59-60, 62; drawn to proton-conducting polyazole based self-supporting compositions made materials made with reacted chemicals.
25. Group II, Claim(s) 56-58, 61 drawn to proton-conducting polyazole based coating compositions comprising an electrode.
- 26.
27. Applicant is required, in reply to this action, to elect a single species to which the claims shall be restricted if no generic claim is finally held to be allowable. The reply must also identify the claims readable on the elected species, including any claims subsequently added. An argument that a claim is allowable or that all claims are generic is considered non-responsive unless accompanied by an election.
28. Upon the allowance of a generic claim, applicant will be entitled to consideration of claims to additional species which are written in dependent form or otherwise require all the limitations of an allowed generic claim. Currently, the following claim(s) are generic: None.

REQUIREMENT FOR UNITY OF INVENTION

29. As provided in 37 CFR 1.475(a), a national stage application shall relate to one invention only or to a group of inventions so linked as to form a single general inventive concept ("requirement of unity of invention"). Where a group of inventions is claimed in a national stage application, the requirement of unity of invention shall be fulfilled only when there is a technical relationship among those inventions involving one or more of the same or corresponding special technical features. The expression "special technical

features" shall mean those technical features that define a contribution which each of the claimed inventions, considered as a whole, makes over the prior art.

The determination whether a group of inventions is so linked as to form a single general inventive concept shall be made without regard to whether the inventions are claimed in separate claims or as alternatives within a single claim. See 37 CFR 1.475(e).

WHEN CLAIMS ARE DIRECTED TO MULTIPLE CATEGORIES OF INVENTIONS

As provided in 37 CFR 1.475(b), a national stage application containing claims to different categories of invention will be considered to have unity of invention if the claims are drawn only to one of the following combinations of categories:

- (1) A product and a process specially adapted for the manufacture of said product; or
- (2) A product and process of use of said product; or
- (3) A product, a process specially adapted for the manufacture of the said product, and a use of the said product; or
- (4) A process and an apparatus or means specifically designed for carrying out the said process; or
- (5) A product, a process specially adapted for the manufacture of the said product, and an apparatus or means specifically designed for carrying out the said process.

Otherwise, unity of invention might not be present. See 37 CFR 1.475(c).

30. The inventions listed as Groups I, and II, do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons:

31. The common feature between Groups I and II is a proton-conducting polymer based on polyazoles; this technical feature is not a special technical feature as it does not make a contribution over the prior art in view of:

32. A) The art as disclosed by Calumdann et al. (DE 101 17 687, as interpreted through PCT/IP02/03901 US filed US 2004/0127588) and corresponding to Calumdann et al. (WO 2002/081547) as interpreted through PCT/IP02/03901 US filed US 2004/0127588) as acknowledged by the Applicant (instant Specification page 2 lines 15-17).

33. Calumdann et al. disclosing proton conducting membrane (Title) based on polyazoles ([0001]) applied as a coating ([0061]) that is comprised in an electrode unit ([0093]-[0094]) such that the membrane is not self-supporting.

34. B) Kiefer et al. (WO 03/074597 as interpreted through PCT/EP03/02397, US filed US 2005/0118477) as indicated by the PCT report of 06/05/2005.

35. Kiefer et al. discloses applications of polybenimidazole materials in proton conducting electrolyte material (Title and [0010]) based upon polyazoles (0050)

indicated as being proton conductive ([0033]); materials are further indicated as being self-supporting ([0186]).

36. The requirement is still deemed proper and is therefore made FINAL.

37. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

38. Claim 28 and its dependent Claims 29-55, 59-60 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

39. Sin the present case, Step B) of Claim 28 presents awkward wording that presents alternative interpretations of the step. The phrase "in an organic phosphonic anhydrides with formulation of a solution and/or dispersion".

40. The Claim is applicable to either an organic phosphonic anhydride or anhydrides.

41. Appropriate action is required.

42. To further prosecution, Claim 28 is taken as reading "... in an organic phosphonic anhydride ..." the "s" per anhydrides, as originally written, being taken as a typographical error.

43. Claim 39 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

44. Instant Claim 39 indicates that the R or R' groups are radicals that represent a C1-C20 carbon containing group.
45. However, the claim, as written, is not limited to how many other atoms, elements, or molecule groups are also part of the group. As such, the claim is unbounded.
46. Appropriate action is required.
47. To further prosecution, R or R' groups are taken as comprising any other atom or element that can be bonded to a hydrogen or phosphorous.

Claim Rejections - 35 USC § 102

48. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

49. **Claims 28-55, 59-60** are rejected under 35 U.S.C. 102(b) as being anticipated by Kiefer et al. (WO 03/074597 as interpreted through PCT/EP03/02397, US filed US 2005/0118477) as enabled by DE 10117687.2 corresponding to DE 10117687 [published 17 October 2002] as interpreted though US filed US 2004/0127588 to Calumdann et al.) {Per enabled, see MPEP 2131.01 (A)}.
50. Kiefer et al. discloses applications of polybenimidazole materials in proton conducting electrolyte material (Title and [0010]) based upon polyazoles (0050))

indicated as being proton conductive ([0033]); materials are further indicated as being self-supporting ([0186]).

51. As to Claims 28-29:

52. Kiefer et al. discloses polymer compositions based upon polyazole materials ([0050]-[0077]; pages 3-6; the aeriels are applicable to being self-supporting membranes after polymerization ([0186]); Kiefer et al. discloses that preferred polymers employed are those applicable to {the enabling reference} ([0081]).

53. Polymers are made by polymerizing an acid in a step indicated as B) ([0035]) after swelling another polymer in step A) (0034)) employing a solvent ([0161]) including polyphosphoric acid or phosphoric acid. The phosphonic acid monomeric material is employed and is applied as in swelling solvent ([0160]) along with a sulfonic acid material ([0164]) and the polymer swelling is improved with addition of an organic solvent ([0161]) to improve the polymer's solubility ([0162]). The resulting polymer membrane formed shows better properties than formerly known doped polymer membranes ([0197]) indicated as comprising polybenzimidazole ([0242]-[0243]) {taken as the process makes a doped membrane}, that are applicable to use in fuel cells ([0199]). Monomeric material is then cross-linked after swelling (Examples 2-3 [0242]-[0243]) {addressing Claims 28-29}.

54. As to Claims 30-55:

55. Examiner note: As Claims 28-29 are product by process claims; the product structure is applicable to the claim limitations. As such, as absent unexpected results, the structure presented by Kiefer et al., as supported by the reference's enabling

reference indicated above, applicable to interpretation of US 2004/0127588 for the preferred polymer materials disclosed by Kiefer et al. (0081)], is taken as indicating that the material applied by Kiefer et al. is enabled according to the polymer material structure disclosed by the enabling reference.

56. Further as to Claims 30-38:

57. The enabling reference indicates that for the preferred polymers employed, the polymers comprise the materials of Claim 30 ([0017]); the materials of Claims 31, 32, 33 ([0018]) and Claim 34 ([0019]) **{addressing Claims 30, 31, 32, 33, 34}**; the amounts of tricarboxylic acid or tetracarboxylic acids being 0-30 mol percent and in particular, 0.5-10% ([0021]) **{addressing Claims 35-36}**; the heteroaromatic carboxylic acids of the enabling reference comprising oxygen, sulphur or phosphorus atoms in the aromatic group ([0020]) **{addressing Claim 37}** and further contain the components of Claim 38 (ibid) **{addressing Claim 38}**.

58. Further as to Claims 39-42:

59. As the processing step is applicable to the product by process Claim 28, as Claim 28 is met, so too are Claims 39-42..

60. Further as to Claims 43, 45:

61. Membranes for the compositions, per the enabling reference ([0025]-[0058]), comprise polymers based on polyazoles containing repeat azole units of general formula (I) and/or (II) and/or (III) and/or

62. (IV) and/or (V) and/or (VI) and/or (VII) and/or (VIII) and/or

63. (IX) and/or (X) and/or (XI) and/or (XII) and/or (XIII) and/or

64. (XIV) and/or (XV) and/or (XVI) and/or (XVI) and/or
65. (XVII) and/or (XVIII) and/or (XIX) and/or (XX) and/or
66. (XXI) and/or (XXII) of pages 4-5 ([0050]) and represent those of instant Claim 43 {addressing Claim 43}.

67. Per the enabling reference, repeating units employed in applicable materials formed for compositions are also indicated on page 6-7 and represent those of instant Claim 45, for repeating number of "n" being greater than 10 ([0077]) {addressing Claim 45}.

68. Further as to Claim 44:

69. Per the enabling reference, repeating ([0067]) units also comprise thiazole, oxadiazole, benzoxazole, quinoxaline, thiadiazole, benzothiazole, benzimidazole, units, inherently taken as applicable to polyparathiazole} with poly benzimidazole being distinguished ([0078] and Example 2 and 3 [0242]-[0243]) {addressing Claim 44}.

70. Further as to Claim 46:

71. As the processing step is applicable to the product by process Claim 28, as Claim 28 is met, so too is Claim 47. In addition, the preferred polymer materials of Kiefer et al. ([0081]) are disclosed by the enabling reference are indicated to be employed as blends ([0090]).

72. Further as to Claim 47:

73. As the processing step is applicable to the product by process Claim 28, as Claim 28 is met, so too is Claim 47. In addition, processing to make materials is

indicated by Kiefer et al. to comprise adding solvent material to adjust viscosity ([0074]); a particularly indicated solvent being phosphoric acid ([0161]).

74. Further as to Claim 48:

75. As the processing steps are applicable to the product by process Claim 28, as Claim 28 is met, so too is Claim 48. In addition, the preferred polymer material of Kiefer et al. ([0081]) are disclosed by the enabling reference as being moisture treated, self-supporting and detachable without damage (0062))

76. Further as to Claims 49-55:

77. The enabling reference indicates that the preferred polymers employed are prepared in steps A) to E) ([0012]) while further indicating that proton conducting material and acid is applicable to step B) ([0076]), Proton conducting material and acid including phosphonic acid is disclosed in Kiefer et al. ([0095] and [0133]).

78. The enabling reference further discloses that the polymer material employed by Kiefer et al. is made by further treating in the presence of moisture to become self-supporting at temperatures above 0°C and less than 150°C and preferably between 20°C to 90°C ([0062]-[0063]) {addressing Claims 49-50}; treatment time is indicated to be from 1 minute to 200 hours ([0069]) {addressing Claim 51}; preferably made material thicknesses are 15-3000 μm ([0064]) {addressing Claims 53-54}; and the material is also applicable to being made such as not to be self-supported when formed onto an electrode ([0094]) {addressing Claim 52}.

79. Further as to Claim 59:

80. Kiefer et al. further discloses that a membrane is comprised in a membrane electrode unit ([0200]), taken as polymer membrane material being inherently comprised with an electrode while also inherently taken as incorporating preferred polymer membranes.

81. Further as to Claim 60:

82. When Claim 59 rejection is taken with the product by process steps of rejected Claim 28, Claim 60 is also rejected.

83. The reference discloses or inherently discloses the limitations of the product by process Claims 28-55, 59-60.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

84. **Claim 62** is rejected under 103(a) as being obvious over Kiefer et al. (WO 03/074597 as interpreted through PCT/EP03/02397, US filed US 2005/0118477), as enabled by Calumdann et al. (DE 10117687 [published 17 October 2002] as interpreted though US filed US 2004/0127588 to Calumdann et al.) {Per enabled, see MPEP 2131.01 (A)}, in view of Calumdann et al. (DE 10117687 [published 17 October 2002]

as interpreted though US filed US 2004/0127588 to Calumdann et al.) as applied to Claims 1-38, 40-55, 58-60 above.

85. Kiefer et al. disclosure as applied to USC 35 102(b) is as addressed above.

86. As to Claim 62:

87. Kiefer et al. is silent towards making compositions according to the steps of Claim 62.

88. On the other hand, Calumdann et al. ([0010]) suggests improved proton conductivity such that subsequent doping of film material is dispensed with.

89. The process is indicated according to the steps per below ([0011]-[0016]):

A) Reaction of one or more aromatic tetramino compounds with one or more aromatic carboxylic Acids or esters thereof which contain at least two acid groups per carboxylic acid monomer, or of one or more aromatic and/or heteroaromatic diaminocarboxylic acids in the melt at temperatures of up to 350 °C,

B) Dissolution of the solid prepolymer obtained as described in step A) in polyphosphoric acid;

C) Heating of the solution obtainable as described in step B) to temperatures of up to 300 °C, under inert gas to form the dissolved polyazole polymer;

D) Formulation of a membrane on a support using the solution of the polyazole polymer from Step C); and

E) Treatment of the membrane formed in step D) until it is self-supporting.

90. Except for step B), the steps are nearly identical to those of instant Claim 28 and instant Claim 62.

91. Further, Calumdann et al. ([0076]), the reference being referred to by Kiefer et al. as providing preferred polymers to the invention of Kiefer et al. ([0081]), teaches that proton conducting materials and acids are applicable to being added to the polymer composition in step B) to achieve further use improvement properties ([0075]).

92. Calumdann et al. further teaches that materials made are of the same or similar structure (pages 2-6) and used for the same or similar application (Abstract) as applicable to those in the instant Specification per instant Claims 28 and 39-43.

93. As such, Calumdann et al. is taken as suggesting that the doping step, for the same or similar materials applicable to the same or similar application for the same or similar device, as taught by Kiefer et al., re-placed by placing the Kiefer et al. acid doping step of a phosphonic acid into the polymer by way of adding the material into step B) instead of by doping; that, material use properties would be expected to be improved. Therefore, by placing a phosphonic acid doping material in to step B, as suggested by Calumdann et al. per above, to make materials taught by Kiefer et al., Claims 28 and 62 are met **{addressing Claim 62}**.

94. It would have been obvious to one of ordinary skill in the art at the time of the invention to have applied moving the doping step from the end of the process to the step B of the process, as taught by Calumdann et al., using the same or similar material for the same or similar application for the same or similar device, to improve the use properties of the compositions taught by Kiefer et al., ready for improvement, with a reasonable expectation of success.

Correspondence

95. Any inquiry concerning this communication or earlier communications from the examiner should be directed to AARON GRESO whose telephone number is (571)270-7337. The examiner can normally be reached on M-F 0730-1700.

96. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Ryan can be reached on 571 272-1292. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

97. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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